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ABSTRACT

The 100-school networking project began in Japan in 1993, sponsored by MITI (Ministry of International Trade and Industry and Ministry of Education). The features of this project can be summarized as follows: (1) one server computer per school; (2) supported by government organization or quasi government organization; (3) supported by local volunteer groups including company engineers; and (4) a voluntary activity plan proposed by each school. The impact of the project on schools, applications, benefits and problems are discussed in this paper in terms of: connection of school to real world; introduction of wide area collaborative learning; change from memory-based teaching to problem-based learning; change of teacher's role; change of communicating skills and computer literacy; establishment of social rules and manners; filtering harmful information; linkage to school curriculum; reducing computer teachers' load on network maintenance; enrichment of school learning environment; Internet-based evaluation methods; and self-establishment by communicating to the real world. (AEF)

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Effectiveness and Some Problems of the Internet Utilization to Education from Overview of School Practice Research in Japan

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The 100-school networking project began in 1993, sponsored by MITI (Ministry of International Trade and Industry) and Ministry of Education, and directly supported and managed by IPA (Information-technology Promotion Agency) and CEC(Center for Educational Computing) and CII (Center for Information Infrastructure). One hundred schools were selected from 1,543 schools applicants. The features of this project can be summarized as follows: (1) one server computer per school, (2) supported by government organization or quasi government organization, (3) supported by local volunteer groups including company engineers, and (4) a voluntary activity plan proposed by each school. This organization is shown in Figure 1.

Many activities were developed by the 100 schools who worked with other schools. These included:

1) Collaborative learning in environmental education such as an acid rain project in which 40 schools participated. The pH of rain was measured at 40 schools and the data were shared by all schools.
2) Report making by enlisting the aid of experts in social studies, in which volunteers answered students' questions.
3) Weather study by connecting to the weather bureau and having students compare weather charts with pictures produced by weather satellites.
4) Cross-cultural education by connecting to overseas schools. This included real time video exchange using CU-SeeMe with a foreign high school and using surveys of topics share information with overseas Japanese schools.

The graph in Figure 2 shows an example of a hamburger price survey in social studies conducted by overseas schools. Children learn economics and social factors by exploring the price of food in different parts of the world.

5) Moral education is addressed using a worldwide questionnaire survey, in which students engage in fruitful discussion about the peace problem based on questionnaire responses about a nuclear experiment conducted by the French government. A portion of the questionnaire is shown in Figure 3. Web-based questionnaires were very effective and more than 2,000 respondents answered from all over the world.

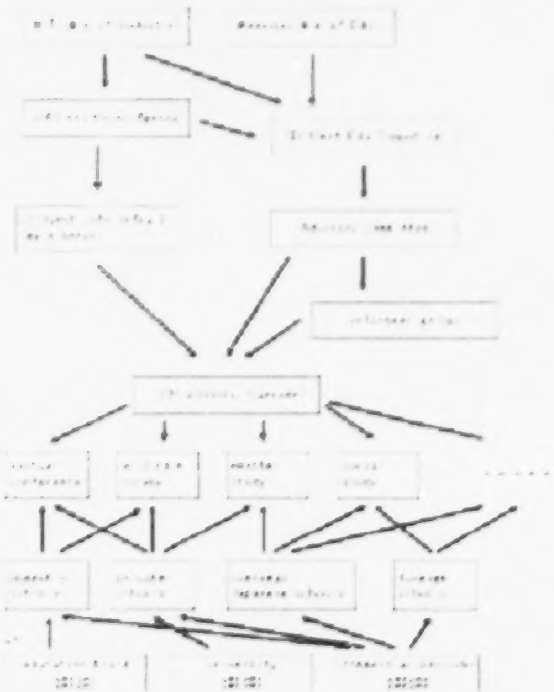

Figure 1. Organization of 100-Schools project.

6) Problem based learning by connecting other schools to a specialist. In one example, a chemical experiment was conducted with input from a professor of chemistry.

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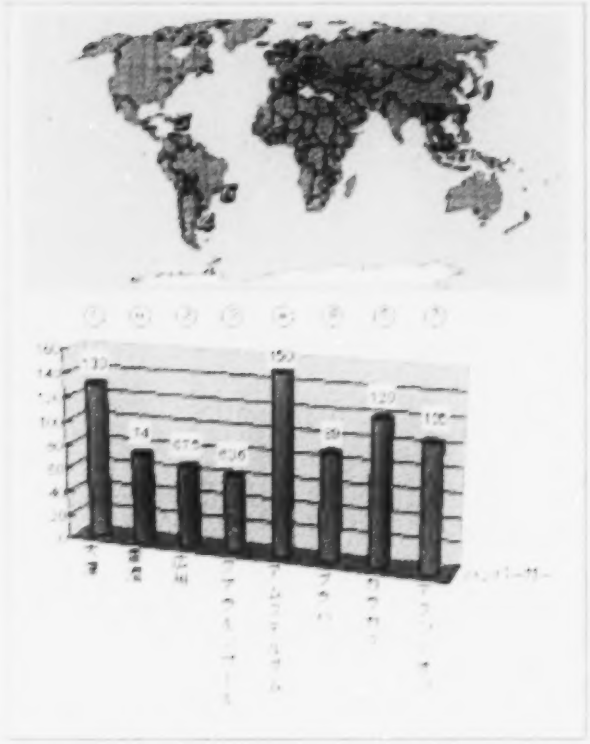

Figure 2. Hamburger price survey study.

Figure 3. Questionnaire survey of peace problem.

7) Special education for handicapped children was accomplished by developing Web pages. Teachers were interested in this opportunity to open children's minds by delivering their works to the worldwide Internet community.

Consideration of Educational Effectiveness based on Project Research

The impact of the project on schools is summarized below.

Connection of School to Real World

The most significant impact was the change of knowledge resources from a limited school space to expanded information resources worldwide. School resources are mainly teachers and textbooks, and by connecting schools to the real world, the resources expanded widely

by including a great deal of information produced by various organizations and professions. Students could gain new knowledge, and the amount of knowledge changed from fixed to dynamic and alive. School textbooks are released by those in authority and are seldom revised. In contrast, Web pages are produced not only by experts but also novices and are often updated.

Table 1 shows a comparison of resources between school and real world.

Table 1
Comparison of School and Real World Resources

School resources	Real world resources
Teachers	Professionals
Textbook	alive information
Teaching Materials	Learning Resources
Fixed by authorities	Dynamic and changeable by situation
not including harmful information	Including Harmful information

Introducing Wide Area Collaborative Learning

In the information age, individual learning was the important concept in school education, but in Internet utilization, collaborative learning was recognized as important. Participants in the exchange project among Japanese and foreign schools reported that through collaborative learning, students exchange different ideas and different ways of thinking. By exchanging ideas and

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opinions about common topics, they can share different ideas and thinking and also find commonality. This works well for promoting cross-cultural understanding.

Change from Memory-based Teaching to Problem-based Learning

A student centered learning style was realized by accessing information in the real world for problem solving. In order to solve problems, students search and retrieve information related to the problems. It is quite different from memory-based teaching. Also, students return to read textbooks for further understanding of the topic. This means that students can link the problem to the fundamental knowledge contained in the textbook. Students make their own knowledge structure depending on the problem, and it works well in solving other problems.

Change of Teachers' Role

By introducing the Internet to schools, especially for problem solving, the role of the teacher changes from knowledge transmitter to facilitator for assisting students in the problem solving process. However, in order to play the role of facilitator, not only students, but teachersthemselves, are required to act as problem solvers.

Change of Communicating Skills and Computer Literacy

There are remarkable differences in communication skills between old media communication, such as face-to-face or telephone, and electronic media communication via the Internet through such resources as e-mail, BBS or the World Wide Web. Old media communication style requires talking and listening skills, whereas electronic media communication style requires writing and reading skills. Also in the old media style, information is stored in the human memory and is easily removed, such as when it is forgotten. On the other hand, with electronic media, information is stored on a computer disk and cannot be deleted unless one intends for it to be removed. In the old media style, communication was possible only with a small number of people. Conversely, with electronic media, communication with large numbers of people can take place, such as using a world wide mailing list. Therefore, communication skills based on writing and reading will be more important in network age. Practical research demonstrates that students make progress in reading and writing skills through Internet communication, so it is necessary to promote students' electronic media skills as part of their education.

Table 2 shows a comparison of communication skills between old media and electronic media.

Problems and Discussion

Establishment of Social Rules and Manners

Various educators have pointed out the importance of establishing social manners for privacy protection and maintaining interpersonal communication. Many teachers have tried to establish social manners through students' volunteer activities.

Table 2
Comparison of Communication Skills

Face to Face	Telephone	E-mail	Bulletin Board/WWW
Verbal & non	Verbal	Texts	Texts and pictures
Talking	Talking	writing	writing and presentation
Listening	Listening	reading	reading and comprehension
Real time		not real time	
Recording only on memory		Recording on computer disk	
Easy to contact		Difficult to contact	
small persons		many persons	
Locally intimate		Set roots ordinance and world wide	
		Computer literacy	
		new communication skills	
		new social manner skills	
		new interpersonal skills	

Filtering Harmful Information

This problem has been pointed out by many educators and researchers. Technically, it is possible to avoid accessing harmful information. Some researchers, including this author, assert the necessity of network awareness education.

Linkage to School Curriculum

At present, the Internet has been used mainly for promoting computer literacy in Japan. The Internet will be used not only in computer education but also in all subjects. In order to realize this goal, it is important to connect Internet usage to school curriculum, and development of lesson plans together with Internet usage activities and development of useful materials.

Reducing Computer Teachers' Load on Network Maintenance

In Japan, few classroom teachers manage and maintain computer environments as volunteer activities. It is necessary to reduce teachers' loads, for example, reducing teaching time introducing a computer coordinator system where computer specialists are employed.

Enrichment of School Learning Environment

Resources will shift from book-based to electronic media-based. In the future, it will be important to enrich the learning environment in such ways as setting up Internet terminals in school libraries, and adding intranets within schools.

Introducing a New Evaluation Method

The Internet is especially useful in problem solving, and in order to evaluate students' problem-solving skills, new evaluation methods, such as portfolio assessment, will be required.

Self-establishment by Communicating to the Real World

Globalization will spread widely and rapidly in the network age. The Internet will be used in schools more and

more as a communication tool with other countries because this use promotes cross-cultural understanding. It also helps us better understand ourselves and our c ture by observing from outside. Self-understanding will le to self-establishment. How to realize self-establishment through Internet communication in a networked society is an important and challenging educational issue.

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